

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:
James F. Kramer

Serial No. *to be assigned*
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For:

Determination of Finger Position

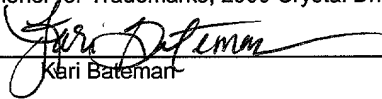
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Signed:


Kari Bateman

PRELIMINARY AMENDMENT

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

Sir:

Applicant respectfully requests entry of the following Preliminary Amendments:

IN THE TITLE

Delete [Determination of Kinematically Constrained Multi-Articulated Structures] and substitute therefor — **Determination of Finger Position** — .

IN THE SPECIFICATION

Please enter the following amendments to the specification. For the convenience of the Examiner, a replacement specification incorporating the requested changes, submitted in the parent application at the request of the Examiner in that application, accompanies this Preliminary Amendment. No new matter has been added.

A-65053-3/RMA

Page 1, line 20, after "Rx's" insert -- 100--; same line, after "Tx", insert -- 101--; same line, after "supply" insert -- 103--; line 21, after "computer" insert -- 104--; same line, after "unit" insert -- 102--; line 27, change "that" to --this--;

Page 2, line 14, change "incumbering" to --encumbering--; line 31, change "master" to --Master--; line 35, change "flex - ensors" to --flex-sensors--;

Page 3, line 38, change "sholder" to --shoulder--;

Page 6, line 11, after "straight" insert --,--; line 35, replace "... " with --Polhemus E/M sensing system with four Rx's and one Tx--; line 36, replace "... " with --are enlarged views of a model for a revolute joint, with 2A the top and 2B the bottom of the cylindrical joint;

Fig. 3 is an illustration of the kinematics of a human palm and finger;

Fig. 4 is an anatomical description of the human hand;

Fig. 5 is a vector representation of the "4-link" class of problems;

Figs. 6 to 10 are illustrations of examples of links and joints located between two points of known relative spatial placement on a general KCMAS;

Fig. 11 is a side view of a link/revolute joint of a human hand, wrist and forearm;

Fig. 12A is a plan view of locations for instrumenting a hand with sensors;

Fig. 12B is a plan view of locations for instrumenting a hand with sensors applied to a glove support;

Fig. 12C is a plan view of a hand with sensors affixed to the fingertips and wrist and a sensor affixed to the metacarpus with a U-shaped clip;

Figs. 13A and B are views of a sensor on a finger-mount "off" and "on" a finger;

Figs. 14A and B are views of a sensor on an alternative finger-mount "off" and "on" a finger;

Figs. 15A and B are views of a sensor on a third alternative finger-mount "off" and "on" a finger;

Fig. 16 is a view of a sensor on a fingernail-like mount for affixing the sensor to a finger;

Fig. 17 is a view of a sensor mounted on a thimble-like structure and a partial finger;

Figs. 18A and B are end and perspective views of sensors mounted on clip-like structures;

Figs. 19A and B are perspective views of a sensor mounted on a band with force feedback and mounted on a fingertip;

Figs. 20A, B and C are perspective side, plan and end views of antennae placed at various positions about a finger;

Fig. 21 is a perspective view of the arm and shoulder as a link/revolute KCMAS;

Fig. 22 is a perspective view of the head and neck as a link/revolute KCMAS;

Fig. 23 is a perspective view of the torso and hip as a link/revolute KCMAS;

Fig. 24 is a perspective view of the lower portion of the leg as a link/revolute KCMAS;

Figs. 25A and B are different perspective views of a body harness; and

Fig. 26 is a diagrammatic body view indicating spatial placements of sensors at various links.--;

Page 7, line 9, after "elements" insert -- 201, 202--; line 11, after "top" insert -- 201--; line 12, after "bottom" insert -- 202--; same line, after "axis" insert -- 203--;

Page 11, line 7, change "[i,j]" to --[2,5]--;

Page 13, lines 15-16, change "normal flexure and the hyperextended" to --flexion and hyperextension--; lines 19 and 24, each instance, change "8" to --9--; line 26, both places, change "9" to --10--; same line, after "loops" insert -- 1000--; line 27, after "axis" insert -- 1002--; line 28, after "axis" insert -- 1002--; same line, after "line" insert -- 1003--; line 30, after "axis" insert -- 1001--; line 31, after "axis" insert -- 1002--; line 33, change first instance of "xx" to -- 1001--; same line, change second instance of "xx" to --1002--;

Page 14, line 5, after "(" insert --e.g., --; line 11, after "degrees" insert --for the spatial placements of the joints to be uniquely determined.--; line 15, change "FIG. 9" to --FIG. 10--; line 19, change "FIG. 9" to --FIG. 10, where 1001 is the yaw axis and 1002 is the pitch axis.--; line 25, after "have a" insert --connecting line, LX, of--; same line, delete "LX, as shown in FIG. 10, ";

Page 17, line 12, change "DOF" to --DOFs--; line 19, change "could" to --may--;

Page 18, cancel line 9 including "(here)", and also cancel the following vertical space; lines 12-13, cancel "relationship of the form shown is FIG. ff. The relationship is a"; line 13, after "polynomial" insert -- relationship--; line 16, cancel ", as described by FIG. ff"; line 28, after "Kramer" insert --,--; line 29, replace "ff" with --11--; line 31, replace "ff" with --11--; line 32, after "goniometer" insert --, FS1,--;

Page 19, line 8, change "ff" to --11--; line 22, change "mcp" to --metacarpus--; line 24, change "ffA" to --12A--; line 25, after "PSE" second instance, insert -- (1201 - 1205)--; same line, after "PSE" third instance, insert -- (1206)--; line 26, after "PSE" first instance, insert -- (1207)--; same line, after "PSE" second instance, insert -- (1200)--;

Page 20, line 1, replace "FIG. ffA-2 provides an" with --A useful--; same line, replace "which" with --may--; same line, replace "employs" with --employ--; line 4, replace "In FIG. ffA-2," with --In one embodiment--; same line, replace "are" with --may be--; line 16, replace "In FIG. ffB-2" with --In another useful embodiment--; line 17, cancel "to"; line 25, after "The" insert -- present--; same line, change "of FIG. ffB-2 also provides" to --may also provide--;

Page 21, after line 17 cancel two vertical spaces; line 18, change "ffB" to --12B--; same line, cancel "same"; same line, after "PSEs" insert -- (1200 - 1207) of FIG. 12A, now shown--; same line, after "material" insert -- (1210 - 1217)--; same line, after "support" insert -- 1218--; line 35, change "ffC" to --12C--; same line, after "hand" insert -- 1228--; same line, after "PSEs" insert -- (1221 - 1225, 1227)--; line 36, after "PSE" insert -- 1226--; line 37, after "clip" insert -- 1229--; same line, after "wires" insert -- 1230--; line 38, after "structure" insert -- 1231--;

Page 22, line 1, after "structure" insert -- 1232--; line 2, after "unit" insert -- 102--; line 4, change "ffc" to --12C--; line 5, change "wrist PSE support structure" with --U-shaped clip--; line 7, change "ffa through ffi" to --13 - 19--; line 8, change "FIG. ffa shows" to --FIGs. 13A and 13B show--; same line, after "PSE" insert -- 1300--; same line, after "band" first instance, insert -- 1301--; line 13, change "FIG. ffB shows" to --FIGs. 14A and 14B show--; same line, after "PSE" insert -- 1400--; same line, after "structure" insert -- 1401--; line 17, change "FIG. ffa" to --FIGs. 13A and 13B--; line 18, change "FIG. ffc shows" to --FIGs. 15A and 15B show--; same line, after "PSE" insert -- 1500--; same line, after "support" insert -- 1501--; line 19, after "strap" insert -- 1502--; same line, after "other" insert -- end 1503--; line 23, change "FIG. ffa" to --FIGs. 13A and 13B--; line 26, cancel one space before "buckle"; line 29, change "ffE" to --16--; same line, after "PSE" insert -- 1600--; same line, after "support" insert -- 1601--; line 31, after "fingernail" insert -- 1602--; line 38, change "FIG. ffa" to --FIGs. 13A and 13B--;

Page 23, line 1, change "fff" to --17--; same line, after "PSE" insert -- 1700--; same line, after "support" insert --

1701--; line 6, change "FIG. ffG shows" to --FIGs. 18A and 18B show--; same line, after "end" insert -- and perspective--; line 7, after "PSE" insert -- 1800--; line 9, after "clip" insert -- 1801--; line 11, after "material" insert -- 1802--; line 13, after "structure" insert -- 1803--; line 16, change "xx" to -- 1802--; same line, after "clip" insert -- 1801--; line 17, change "FIG. ffH shows" to --FIGs. 19A and 19B show--; same line, after "PSE" insert -- 1900--; same line, after "structure" insert -- 1901--; lines 19 and 20, add double quotes around "Force Feedback and Texture Simulating Device"; line 25, change "FIG. ff" to -- FIGs. 22A - 22C--; same line, change "provides" to --provide the side, plan and end-view of--; same line, after "antennae" insert -- shapes--; same line, after "KCMAS." insert --In these Figures, antennae 2000 is placed in juxtaposition to the fingernail, antennae 2001 is placed in juxtaposition to one side of the fingertip, antennae 2002 is placed in juxtaposition to the other side of the fingertip, antennae 2003 is placed in juxtaposition to the end of the fingertip, antennae 2004 is placed in juxtaposition to the pad-side of the fingertip, and antennae 2005 is placed around the fingertip.--; lines 28, 29 and 30, change the three instances of "body-part" to --other body-part--; line 32, change "FIG. ffA is a" to --A--; line 37, change "the PSE" to --PSE2--; same line, change "ff" to --3--;

Page 24, line 10, change "FIG. ff provides a" to --A--; same line, change "where there is" to --comprises--; line 14, change "FIGs. ffA - ffB provide additional" to --Additional--; same line, after "embodiments" insert -- exist--; line 16, change "FIG. ffA" to --One preferred embodiment--; line 17, change "FIG. ffB provides an example, comprising a combination of the embodiment of FIG. ffA where" to --Another embodiment comprises--; line 18, change "encompass" to --encompassing--; line 19, change both instances of "encompass" to --encompassing--; line 20, change "For example" to --In this embodiment--; line 26,

change "FIG. ffC provides" to --Yet another embodiment comprises only--; line 28, change "ff" to --21--;

Page 25, line 1, after "line" insert -- (e.g., L5)--; same line, after "PSE" insert -- (e.g., PSE4)--; same line, after "line" insert -- (e.g., 2100)--; line 3, change "ff" to --3--; line 7, after "PSE3" insert -- (FIG. 11)--; line 8, change "ff" to --22--; line 10, after "L4" insert -- (FIG. 11)--; line 33, cancel "FIG. ff shows the revolute joint/link of one side of a human body." and replace with --FIG. 22 shows a revolute joint/link model of the head and neck portion, FIG. 23 the torso and one hip, and FIG. 24 one leg, of a human body.--; line 34, Change "Only" to --When only--; same line, after "clarity" change the "but" to a --,--; line 35, before "PSEs" insert --In FIGs. 22 - 24,--;

Page 26, line 8, change "model of FIG. ff" to --models of FIGs. 22 - 24--; line 9, after "arm", insert -- (FIGs. 11 and 21)--; line 14, change "ffA and ffB" to --25A and 25B--; lines 15 and 16, change "ff - ff" to --11 and 21 - 24--; line 17, after "headband" insert -- 2500--; line 19, change "harness as shown in FIGs. ffA and ffB. FIGs. ffA" to --harness 2501 as shown in FIGs. 25A and 25B. FIGs. 25A--; line 20, change "ffB" to --25B--; same line, after "sensors" insert -- 2502--; line 21, change "instead of" to --in addition--; same line, after "area" insert -- (2503)--; line 22, after "device" insert -- 2504--; line 27, after "PSE7" -- 2505--; same line, change "ffA and ffB" to --25A and 25B--; line 28, after "structure" insert -- 2506--; same line, change "ffA and ffB" to --25A and 25B--; line 29, after "PSE" insert -- 2507--; line 30, after "support" insert -- 2506--; line 32, after "device" insert -- 2504--; line 36, change "ffA and ffB" to --25A and 25B--; line 39, change "ff - ff" to --12 - 19--;

Page 27, line 1, change "and toe" to --2508 and toe 2509--;
line 2, after "stockings" insert -- 2510--; line 15, change "ff"
to --26--; line 18, after "sensor." insert -- The hand on the
left side of the body outline in FIG. 26 provides one embodiment
for hand-sensing which uses only goniometers for measuring the
positions of the fingers relative to the metacarpus.
Goniometers are shown only on one finger for clarity. The hand
on the right side of the body outline provides one embodiment for
hand-sensing which uses only PSEs to measure the positions of the
fingers. The PSEs are also shown only on one finger for
clarity.--; line 22, change "below" to --on the forearm side of--
; same line, change "Such an embodiment" to --An embodiment which
measures many important articulations of a human body,
incorporating only PSEs to measure the articulations of the
fingers as shown on the hand on the right of the body outline in
FIG. 26--; line 26, after "fingertips" insert -- (as shown on the
hand on the left of the body outline in FIG. 26)--; line 28,
change "embodiment of FIG. ff requires" to --embodiments of FIGs.
11, 12 and 21 - 25 requires--:

Please enter the following additional Amendments to the specification:

Page 7:25:

delete "be generally" and substitute therefor--**generally be**..

Page 13:

line 14: delete " $c2 = (x^2 + y^2 - a3^2 - a4^2) / (2*a3*a4)$ "
and substitute therefor
-- $c2 = (x^2 + y^2 - a3^2 - a4^2) / (2*a3*a4)$ --

line 15: delete " $s2 = -$ or $+(1-c2^2)^{-1/2}$ "
and substitute therefor
-- $s2 = -$ or $+(1-c2^2)^{-1/2}$ --

Page 23:20:

after "Simulating" insert - Interface- .

IN THE CLAIMS

Please cancel claims 1-8.

Please add the following new claims:

- 9. A system for determining a finger position, the system comprising:
- a finger mount adapted to be worn on a finger of a living being, the finger mount comprising one or more of a ring, a clip, a thimble, and a false fingernail;
 - a position sensor comprising a position sensing element on the finger mount, the position sensor being capable of generating a signal related to the spatial position of the position sensing element; and
 - a data processor capable of receiving the signal and generating an output signal indicative of the spatial position of the position sensing element, whereby the spatial position of the finger may be determined.
10. A system according to claim 9 wherein the finger mount comprises a ring.
11. A system according to claim 10 wherein the ring comprises an elastic band.
12. A system according to claim 9 wherein the finger mount comprises a clip comprising flexible and separable portions.
13. A system according to claim 9 wherein the finger mount comprises a thimble .
14. A system according to claim 13 wherein the thimble comprises elastic material.
15. A system according to claim 9 wherein the finger mount comprises an artificial fingernail comprising a support adhesively attachable to a fingernail on the finger.
16. A system according to claim 9 wherein the position sensing element comprises an electromagnetic energy transmitter or an electromagnetic energy receiver.
17. A system according to claim 9 further comprising a second position sensing element positionable on another link of the finger, another finger, or a wrist of the living being.
18. A system according to claim 9 wherein the finger mount is positionable on a distal link of the finger, and further comprising a second position sensing element positionable on a proximal link of the finger separated from the distal link by an intermediate link.

19. A system according to claim 18 wherein the data processor is capable of calculating the spatial position of the intermediate link without providing a position sensing element thereon.

20. A system according to claim 9 further comprising a support structure adapted to apply a force reflection to the finger.

21. A system for determining finger position and for controlling a graphic object, the system comprising:

a finger mount adapted to be worn on a finger of a living being, the finger mount comprising one or more of a ring, a clip, a thimble, and a false fingernail;

a position sensor comprising a position sensing element on the finger mount, the position sensor being capable of generating a signal related to the spatial position of the position sensing element; and

a data processor capable of receiving the signal and generating an output signal indicative of the spatial position of the position sensing element, wherein the output signal is used to control the display of a graphic object.

22. A system according to claim 21 wherein the finger mount comprises a clip comprising flexible and separable portions.

23. A system according to claim 21 wherein the finger mount comprises a thimble comprising elastic material.

24. A system according to claim 21 wherein the graphic object is a cursor capable of interacting with a virtual object or a computer program.

25. A system according to claim 21 further comprising a support structure adapted to apply a force reflection to the body part.

26. A system according to claim 27 wherein the sensing element comprises a transmitter.

27. A system for controlling a graphic object generated by a computer, the system comprising:
a finger mount adapted to be worn on a finger of a living being, the finger mount comprising one or more of a ring, a clip, a thimble, and a false fingernail;

a sensor comprising a sensing element on the finger mount, the sensor generating a signal related to the movement of the sensing element; and

a data processor receiving the signal and generating a control signal to control the graphic object generated by the computer in relation to the movement of the sensing element.

28. A system according to claim 27 wherein the finger mount comprises a clip comprising flexible and separable portions.

29. A system according to claim 27 wherein the sensing element is a position sensing element.

30. A system according to claim 27 wherein the graphic object is a cursor.

31. A system according to claim 30 wherein the cursor is capable of interacting with a virtual object or a computer program.

32. A system according to claim 27 further comprising a support structure adapted to apply a force reflection to the body part.

33. A system according to claim 27 wherein the sensing element comprises a transmitter.

34. A system according to claim 33 wherein the transmitter is wireless. —

REMARKS

Claims 1-8 have been canceled without prejudice or disclaimer. Newly added claims 9-34 are presently pending.

The amendments are supported by the specification and the original claims. For example, new claims 9-34 are supported at least by Figures 13A through Figure 20C. No new matter has been added.

Reconsideration of the present case in view of the above amendments and the remarks herein is requested.

The Commissioner is hereby authorized to charge any additional fees which may be required by this paper, or to credit any overpayment, to Deposit Account No. 06-1300 (No. A-65053-3/RMA)

RESPECTFULLY SUBMITTED,
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